

QUICK LOOK TEST REPORT

FOR
DEMONSTRATING
JMCIS ON-LINE SERVICES
AT CINCPACFLT
AND
SELECTED
PACIFIC FLEET SHIP(S)

(Short Title:

JMCIS On-Line Services Test Report

(JOSTER)

(Work In Progress Draft)

30 January 1997

NCCOSC RDT&E Division
San Diego, CA 92152-5001

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EXECUTIVE SUMMARY

The Joint Maritime Command Information System (JMCIS) is produced and operated in an evolutionary development environment. As a result, JMCIS is constantly undergoing changes. These changes are installed on geographically diverse operational systems serving operational and administrative commanders on a nearly continuous basis. These changes have required associated services (such as configuration management, software installation, and testing). Traditionally, these services have been provided at the JMCIS site, ashore and afloat.

JMCIS Wide Area Network Support (JWANS) expands the JMCIS service concept to include services provided on-line between the JMCIS Development Facility at the Naval Command, Control and Ocean Surveillance Center (NCCOSC) Research, Development, Test & Evaluation Division (NRaD) and the JMCIS site, ashore and afloat. On-going testing is conducted in four phases:

- Phase 1** - Machine to Machine at NRaD (with connectivity internal to NRaD)
- Phase 2** - Machine to Machine at NRaD (with connectivity external to NRaD)
- Phase 3** - Machine (server) at NRaD to Remote Machine(s) (client(s)) at the JMCIS suite serving Commander in Chief, U. S. Pacific Fleet (CINCPACFLT)
- Phase 4** - Machine (server) at NRaD to Remote Machine(s) (client(s)) on a Pacific Fleet Ship (TBD).

Testing requirements are specified in terms of two services ...remote configuration sensing and remote software (patch) install. Minimum required testing (in terms of certifying successful completion of a demonstration phase) is specified in terms of two test sequences:

- Remote Configuration Sensing of a Single Machine with Continuous Communications (1RC)
- Posted Remote Install of a Small Patch with Continuous Communications (PSC).

Additional test sequences of special testing interest have also been investigated. Of particular interest, is the effect of a communications outage on the quality and utility of on-line services. Test sequences with continuous communications (as the two minimum requirements introduced above) have a designation ending in "C". Test sequences with communications outages have a designation ending in "O". Thus sequence 1RO tests remote configuration sensing of a single machine with communications outages.

The JWANS concept envisions the demonstration of on-line services using one or more commercial-off-the-shelf (COTS) enterprise management software products. This **Quick Look Test Report** provides information on one such product...the Tivoli Management Environment, Release 10 (TME 10) . The structure of the test program supports testing of additional COTS products (such as Computer Associates (CA) UNICENTER (CAU)).

This **Quick Look Test Report** provides a high level overview of the JWANS testing conducted at NRaD and CINCPACFLT during January of 1997. Test sequences in phase 1, 2, & 3 were conducted as summarized in Sections 3 & 4. Evaluations and recommendations are summarized in Section 5.

The purpose of this **Quick Look Report** is to:

- a. Provide a Quick Look of Phase 1, 2 & 3 testing to date.
- b. Provide insights for planning and implementing Phase 4 testing on a designated PACFLT ship.

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SECTION 1 - SCOPE

1.1 IDENTIFICATION

This **Quick Look** Joint Maritime Command Information System (JMCIS) On-Line Services **Test Report (JOSTER)** describes the qualification testing performed during January 1997. This testing is performed to:

- a. Demonstrate the feasibility and utility of providing JMCIS on-line services under a variety of connectivity conditions.
 - b. Evaluate and compare the effectiveness of various commercial-off-the-shelf (COTS) enterprise management tools to provide specified on-line services. This **Quick Look** version of the **JOSTER** reports on one such COTS Product... Tivoli Management Environment Release 10 (TME 10). Two services (involving remote configuration sensing and remote software (patch) install) are specified in Section 3 of this Test Description. The testing structure specified in this version of the **JOSTER** supports the testing of additional COTS products (such as Computer Associates (CA) UNICENTER) and additional services.
 - c. Support the establishment of a demonstration facility at NRaD that will manage the transition
- from phased demonstration of selected on-line services at pilot sites, ashore and afloat
 - to implementation of customer focused on-line services at selected JMCIS/GCCS (Global Command and Control System) sites, ashore and afloat.

1.2 SYSTEM OVERVIEW

JMCIS consists of two elements: JMCIS Afloat, which developed out of the Naval Tactical Command System-Afloat (NTCS-A) and JMCIS Ashore, which developed out of the Operations Support System (OSS). JMCIS is produced and operated in an evolutionary development environment. As a result, JMCIS is constantly undergoing changes. These changes are installed on geographically diverse operational systems serving operational and administrative commanders on a nearly continuous

basis. These changes have required associated services (such as configuration management, software installation, and testing). Traditionally, these services have been provided at the JMCIS site, ashore and afloat.

This report describes testing required to expand the JMCIS service concept to include services provided On-Line between the JMCIS Development Facility at the Naval Command, Control and Ocean Surveillance Center (NCCOSC) Research, Development, Test & Evaluation Division (NRaD) and the JMCIS site, ashore and afloat. Testing will be conducted in four phases:

- Phase 1** - Machine to Machine at NRaD (with connectivity internal to NRaD)
- Phase 2** - Machine to Machine at NRaD (with connectivity external to NRaD)
- Phase 3** - Machine (server) at NRaD to Remote Machine(s) (client(s)) at the JMCIS suite serving Commander in Chief, U. S. Pacific Fleet (CINCPACFLT)
- Phase 4** - Machine (server) at NRaD to Remote Machine(s) (client(s)) on a Pacific Fleet Ship (TBD).

1.3 DOCUMENT OVERVIEW

This document reports on the testing performed during January 1997 related to the phased (Phases 1, 2, and 3) demonstration of JMCIS On-Line Services. This **Quick Look JOSTER** has been developed using DI-MCCR-80017A (Software Test Report (STR)) as a guideline. The format of this data item description was modified to reflect the nature of this testing which, while based in software, also involves JMCIS Wide Area Network Support (JWANS) connectivity, order wire communications and test processes at multiple sites.

- Section 1 introduces the concept of JMCIS On-Line Services and describes a phased demonstration approach.
- Section 2 provides a list of documents referenced by this JOSTER.
- Section 3 provides an overview of testing.
- Section 4 discusses test results.
- Section 5 lists evaluation and related recommendation items based on testing experience to date.
- Section 6 provides notes including a listing of acronyms and a discussion of terminology (test structure related terminology is provided in Paragraph 1.4.1 for ease of reference).

- Appendix A provides a JMCIS On-Line Test Log for January 1997.
- Appendix B provides a summary of JMCIS On-Line Test Comments.

1.4 TESTING OVERVIEW

1.4.1 TEST STRUCTURE TERMINOLOGY

(1) Test Phase. There are four test phases based on connectivity and site configurations.

(2) Test Event. For any test phase (or phases), one or more test events may be scheduled. A test event is a block of time during which resources are allocated for testing purposes. During this block of time, the Test Director may conduct one or more test sequences or, equivalently, run the same sequence more than once with or without changing parameters (such as the size of a remote posting patch).

(4) Test Sequence. A sequence of test cases that, taken together, fulfills a specific test requirement. Test sequence requirements (minimum and additional special requirements) are discussed in Paragraph 3.1.

(5) Test Cases. The building blocks of each test sequence. Specific test cases will be defined and integrated into a test sequence as necessary to fulfill testing requirements at each site and for each phase. Test cases may be scripted by the Test Director (and designated assistants) or provided by the vendor of the Product(s) under evaluation.

1.4.2 MINIMUM TEST SEQUENCE REQUIREMENTS

a. Remote Configuration Sensing

(1) Test Sequence 1RC. Remote configuration sensing of one machine with **continuous** communications.

(2) Test Sequence 1RO. Remote configuration of one machine with communications **outages**.

b. Posted Install

(1) Test Sequence PSC. Posted install of one small patch with **continuous** communications.

(2) Test Sequence PSO. Posted install of one small patch with communications **outages**.

Test Sequences 1RC and PSC represent the minimum testing requirements for each phase. These test sequences demonstrate basic on-line services. Test sequences with project unique designators ending with the letter "C" are performed with continuous communications.

Test Sequences 1RO & PSO represent "damage control" testing in which communications outages are experienced. Test sequences with project unique designators ending with the letter "O" are performed with communications outages imposed.

1.4.3 PHASED BASED TEST SEQUENCE DESIGNATION

The complete project unique identifier for a test sequence consists of the above designator followed by the phase number in parentheses. Thus: 1RO(1) is test sequence 1RO in Phase 1; PSO(3) is test sequence PSO in Phase 3. A complete listing of these project unique identifiers for 1RC, 1RO, PSC, and PSO is provided in Table 1.

Table 1 - Project Unique Identifiers

Generic	1RC	1RO	PSC	PSO
Phase 1	1RC(1)	1RO(1)	PSC(1)	PSO(1)
Phase 2	1RC(2)	1RO(2)	PSC(2)	PSO(2)
Phase 3	1RC(3)	1RO(3)	PSC(3)	PSO(3)
Phase 4	1RC(4)	1RO(4)	PSC(4)	PSO(4)

Phase unique parenthetical notation is used (in this Test Report and throughout the test program) when necessary to differentiate between test phases; otherwise, it is omitted (i.e., the generic 1RC, 1RO, PSC, PSO is used).

SECTION 2 - REFERENCED DOCUMENTS

2.1 GOVERNMENT DOCUMENTS

The following documents were used as reference during the creation of this **Quick Look JOSTER**.

a. DI-MCCR-80017A, 5 December 1994, Software Test Report (STR) Data Item Description (DID). This DID supersedes DI-MCCR-800017, the Software Test Report DID initially specified under Contract N66001-93-D-0014. As discussed in Paragraph 1.3, the format of DI-MCCR-80017A was modified to reflect the nature of this testing which, while based in software, also involves JMCIS Wide Area Network Support (JWANS) connectivity, order wire communications and test processes at multiple sites.

b. **Test Description** for Demonstrating JMCIS On-Line Services at CINCPACFLT and Selected Pacific Fleet Ship(s) (Short Title: JMCIS On-Line Services Test Description (**JOSTED**)), Work in Progress Draft, 16 January 1997.

c. **Test Plan** for Demonstrating JMCIS On-Line Services at CINCPACFLT and Selected Pacific Fleet Ship(s) (Short Title: JMCIS On-Line Services Test Plan (**JOSTEP**)), Work in Progress Draft, 16 December 1996.

d. **Implementation Plan** for Demonstrating JMCIS On-Line Services at CINCPACFLT and Selected Pacific Fleet Ship(s) (Short Title: JMCIS On-Line Services Demonstration Plan (**JOSDEP**)), dated 29 February 1996.

e. JMCIS Wide Area Network Report, dated 30 September, 1995.

2.2 NON-GOVERNMENT DOCUMENTS

a. Tivoli TME 19 Distributed Systems Management Proposal for JMCIS On-Line Services, October 30, 1996.

b. CA UNICENTER Technical Information.

SECTION 3 - TEST OVERVIEW

3.1 TEST SUMMARY

Test results for 1RC, 1RO, PSC, AND PSO are summarized in Table 2. Test sequences references in that table are described in the Paragraph 3.1.1 (test sequences associated with minimum testing requirements) and Paragraph 3.1.2 (additional special testing requirements).

Table 2 - Test Results Summary Table for 1RC, 1RO, PSC & PSO

Test Sequence	Success	Failure/Errors	Remarks
1RC(1)	•		
1RC(2)	•		
1RC(3)	•		
1RC(4)			To be scheduled
1RO(1)	•		
1RO(2)	•		
1RO(3)	•		
1RO(4)			To be scheduled
PSC(1)	•		
PSC(2)	•		
PSC(3)	•		
PSC(4)			To be scheduled
PSO(1)	•		
PSO(2)	•		
PSO(3)	•		
PSO(4)			To be scheduled

3.1.1 MINIMUM TESTING REQUIREMENTS

Successful completion of two basic test sets

- Remote Configuration Sensing of one Remote Machine With Continuous Communications (1RC)
- Posted Install of one Small Patch with Continuous Communications (PSC))

constitutes the minimum requirement for successfully completing a test at each of the four phases. The additional test sequences described below are desirable within the time constraints of the testing process.

3.1.2 SPECIAL TESTING REQUIREMENTS

During the course of developing a concept of operations for JMCIS On-Line Services, various special requirements were identified that are of testing interest. Although not critical to the initial demonstration of selected JMCIS On-Line Services envisioned under the test description, these requirements are of value for one or more of the various reasons:

- They Identify Real World Issues to Be Faced in Day to Day Provision of On-Line Services.
- They Provide Insight into Scaling and Organizational Issues.
- They Address Issues of Special Interest to Potential Users of JMCIS On-Line Services.

The Special Requirements addressed in this test description include:

- Variable Communications
- Variable Work Station Configurations at the Remote End
- Variable Size Software Install Patches
- Effect of Firewalls on Remote Sensing
- Heterogeneous Operating Environments (e.g., UNIX and Windows NT).

Special requirements are incorporated into our test plan as described in Tables 3 and 4. The remainder of this paragraph discusses these special requirements in terms of testing the two On-Line services specified in this test description.

3.1.2.1 SPECIAL REQUIREMENTS ASSOCIATED WITH TESTING FOR REMOTE CONFIGURATION SENSING

The minimum testing requirement for remote configuration sensing is one remote machine (in standard JMCIS configuration) with continuous communications. This test sequence is designated 1RC. Test Sequence 1RC and additional test sequences that address special requirements associated with testing for remote configuration sensing are listed in Table 3 and discussed below.

Table 3 - Remote Configuration Sensing Test Sequences

Remote Machine Configuration	With Continuous Comms	With Comms Outages
One Remote Machine		
Standard Machine	1RC (Note 1)	1RO
Standard Machine with Firewall	1RFC	1RFO
Windows NT Machine	1RWC	1RWO
Multiple Remote Machines		
Fixed LAN/MAN Configuration	MRFC	MRFO
Dynamic LAN/MAN Configuration	MRDC	MRDO

Note 1. Minimum testing requirement.

One Remote Machine with Communications Outages (1RO).

Builds on the minimum testing requirement (One Remote Machine With Continuous Communications (1RC)) to gain insight on the effect of communications outages on remote configuration sensing.

One Remote Machine with Firewall (1RFC & 1RFO)

Investigates the effects of firewalls on remote sensing.

Windows NT Machine (1RWC & 1RWO)

Certain user communities may perform JMCIS operations on non UNIX machines. For example, COMNAVSURFPAC is interested in the ability to use remote sensing for SURFPAC units with Windows NT machines. This test sequence investigates this area of interest. In the future, additional machines may be investigated.

Multiple Machines With Fixed LAN/MAN Configuration (MRSC & MRSO)

Builds on 1RC and 1RO to gain insight on remote configuration sensing when more than one machine is on the remote site local area or metropolitan area network (LAN/MAN). Machine "membership" on the LAN/MAN remains static.

Multiple Machines With Dynamic LAN/MAN Configuration (MRVC & MRVO)

Similar to MRSC & MRSO except that machine "membership" on the remote site LAN/MAN may be dynamic. That is, machines can log on and off the LAN/MAN during the course of the test.

3.1.2.1 SPECIAL REQUIREMENTS ASSOCIATED WITH TESTING FOR REMOTE SOFTWARE (PATCH) INSTALL

The minimum testing requirement for remote software (patch) install is posted installation of a small patch on one remote machine (in standard JMCIS configuration) with continuous communications. This test sequence is designated PSC. Test Sequence PSC and additional test sequences that address special requirements associated with testing for remote software (patch) install are listed in Table 6 and discussed below.

A "posted" installation involves the posting of a software change onto a workstation at a remote site. This workstation then actually controls the installation on other machines at that site. In this case, NRaD may (in addition to posting the software change) support the software installation by working in a collaborative manner with the remote site workstation controlling the installation. The actual nature of this collaborative support will vary with each remote site. Posted install sequences are designated with a first letter "P".

A "direct" installation involves the direct installation of software from NRaD to a remote machine. Although direct installation raises various control and configuration management issues (that will be further identified and addressed by the NRaD demonstration facility), the ability to provide direct installs (within controls established at the remote site) will greatly enhance the utility of On-Line services. Direct install sequences are designated with a first letter "D".

For both posted and direct installs, "small" and "variable" patches shall be used. For standardized testing purposes, there shall be one small patch selected for use in each phase. Additional variations to this patch may be made (in terms of size and complexity) to investigate scalability factors.

Table 4 - Remote Software (Patch) Install Test Sequences

Remote Software (Patch) Install	With Continuous Comms	With Comms Outages
<u>Posted Install on One Remote Machine</u>		
Standard Machine		
Small Patch	PSC (Note 1)	PSO
Variable Patch	PVC	PVO
Windows NT Machine		
Small Patch	PWSC	PWSO
Variable Patch	PWVC	PWVO
<u>Direct Install With Remote Machines</u>		
Fixed LAN/MAN Configuration		
Small Patch	DFSC	DFSO
Variable Patch	DFVC	DFVO
Dynamic LAN/MAN Configuration		
Small Patch	DDSC	DDSO
Variable Patch	DDVC	DDVO

Note 1. Minimum testing requirement.

POSTED INSTALLS

Posted Install Of One Small Patch On One Standard Remote Machine with Communications Outages (PSC).

Builds on the minimum testing requirement (Posted Install Of One Small Patch On One Remote Machine with Continuous Communications (PSC)) to gain insight on the effect of communications outages on remote software installations.

Posted Install Of Variable Patch On One Standard Remote Machine (PVC & PVO)

Builds on insight gained from PSC and PSO to investigate scalability factors associated with various size patches (including transfer of increasingly complex files)

Posted Install On Windows NT Machine (PWSC, PWSO, PWVC & PWVO)

Investigates remote software posted onto a Windows NT machine under various conditions of communications and sizes of patches.

DIRECT INSTALLS

Investigates situations where software is directly installed by NRaD on a remote machine.

Fixed LAN Man Configuration (DFSC, DFSO, DFVC & DFVO)

Investigates direct installation when more than one machine is on the remote site local area or metropolitan area network (LAN/MAN). Machine "membership" on the LAN/MAN remains static.

Variable LAN Man Configuration (DDSC, DDSO, DDVC & DDVO)

Similar to DFS* & DFV*, except that machine "membership" on the remote site LAN/MAN may be dynamic. That is, machines can log on and off the LAN/MAN during the course of the test.

3.2 TEST RECORD

This **Quick Look Test Report** reviews Phase 1, 2 & 3 testing conducted during January 1997. Some Phase 1 & 2 testing was conducted in Calendar Year 1996. A chronological listing of test sequences conducted in January 1997 is provided in Table 5. A narrative discussion of each test sequence listed in Table 5 is provided in

Appendix A, JMCIS On-Line Test Log. Information developed during the testing process that relates to more than one particular test sequence is provided in Appendix B, JMCIS On-Line Test Comments.

A principal objective of this **Quick Look Test Report** is to provide insights for conducting follow-on testing, particularly Phase 4 testing on a designated PACFLT ship. Recommendations to facilitate such follow-on testing are provided in Paragraph 5.2.

Table 5 - Chronological Listing of Test Sequences

Sequence	Test Results	On-Line Time	Remarks
22 Jan 97			
PWSC(1)	Satisfactory		
23 Jan 97			
1RWC(1)	Inconclusive		Properties Only
1RC(1)	Satisfactory	42 sec	Remote.
1RC(1)	Satisfactory	32 sec	Local Lanai
1RC(3)	Satisfactory	16 min 27 sec	Thru Tivoli
"1RC(3)"	Satisfactory	12 min 30 sec	Run Locally. 4 Min longer to run thru Tivoli
PSC(3)	Satisfactory	26 sec	19.tar. Overwrite protection demonstrated (10 sec)
PVC(3)	Satisfactory	3 min 6 sec	18.tar
1RC(2)	Satisfactory	19 sec	Remote
"1RC(2)"	Satisfactory	9 sec	Local
PSC(2)	Satisfactory	17 sec	19.tar (512 sectors). Overwrite protection demonstrated (7 sec)
PVC(2)	Satisfactory	70 sec	13.tar (8128 sectors)
PVC(3)	Satisfactory	103 sec	13.tar
PVO(3)	Inconclusive		Comms hung up
PVC(3)	Satisfactory	3 min 30 sec	13.tar
PVO(3)	Inconclusive		Comms hung up
27 Jan 97			
PSC(3)	Satisfactory		13.tar (4,147,200)
PSO(3)	Satisfactory		13.tar
PVC(3)	Satisfactory		22.tar (15,134,720)
PVO(3)	Satisfactory		22.tar
28-30 Jan 97			
Ongoing Testing of Communications Outages & Direct Installs			
30 Jan 97			
DFSC(1)	Satisfactory		

SECTION 4 - TEST RESULTS

4.1 TEST SEQUENCE STEPS

A test event is any block of time and resources allocated to JMCIS on-line testing. In general, multiple test sequences can be run during any given test event. For example, the test event scheduled for 27 January 1997 contained the various test sequences listed in Table 5 under 27 January 1997.

Test steps for a generic test event are introduced in Paragraph 4.0 of the JOSTED, Reference 2.1.b. Table 2 of the JOSTED (repeated here in the **Quick Look JOSTER** as Table 6 for ease of reference) outlines those steps.

As discussed in the JOSTED, Step 6 (summarized in Table 6 of this report and discussed in more detail in Paragraph 4.0 of the JOSTED) is a generic module for any chosen test sequence. Conditions encountered for each individual test sequence are provided in Appendix A. General deviations from these steps are discussed in Paragraph 4.2.

Table 6 - Sequential Test Step Template

Step	Action
1	Verify Phase Test Preparations Completed
2	Observe & Record (O&R) Pretest Condition of the Target Machine
3	O&R Loading Immediately Before Initiation of On-Line Service Session
3.1	O&R Network Loading
3.2	O&R Target Machine CPU Loading
4	Initiate On-Line Service (OLS) Session
5	O&R Loading Immediately Before Providing On-Line Service
5.1	O&R Network Loading
5.2	O&R Target Machine CPU Loading
Generic Test Sequence Based On-Line Service Module (Start)	
6	<u>Provide On-Line Service</u>
	<ul style="list-style-type: none"> Remote Sensing of Target Machine Configuration (1RC or 1RO) Posted Install of One Small Patch (PSC pr PSO) etc.
6.1	Commence On-Line Service (e.g., Remote Sensing or Posted Install)
6.2	O&R Start Time
6.3	O&R Loading During Service <ul style="list-style-type: none"> Network Loading Target Machine CPU Loading
6.4	Complete On-Line Service
6.5	O&R Finish Time
6.6	O&R Loading Immediately After Service <ul style="list-style-type: none"> Network Loading Target Machine CPU Loading
6.7	O&R Tool Derived Configuration of Target Machine at Target Machine
6.8	O&R Tool Derived Configuration of Target Machine at Server
6.9	Compare 6.8 and 6.9
Generic Test Sequence Based On-Line Service Module (End)	
Communications Outage Module (Start) (Nominal Insertion Point between Sub-steps 6.1 and 6.5)	
O	Interrupt Communications
O.1	Insert/Experience Communications Outage
O.2	O&R Operator Indications of Communications Outage
O.3	O&R Any Unsuccessful Attempts to Reestablish Communications
O.4	Reestablish Communications
O.5	O&R Operator Indications of Reestablished Communications
O.6	Return to Step 4, 6, or 8.
Communications Outage Module (End)	
7	Terminate On-Line Service Session
8	Terminate Test Event

4.2 TEST SEQUENCE DEVIATIONS

a. Observing and Recording Loading Metrics.

(1) Network Loading. Network loading was determined by using IP Accounting on NRaD's CISCO Router. Accordingly network loading observations were limited to loading over this device. Specifically, network loading was not observed for the LAN at NRaD (e.g., in Phase 1) or for the LAN/MAN at CINCPACFLT (in Phase 3). In any case, the network loading metric observed was the amount of information transferred (bytes), not the rate of information transferred (i.e., bytes per second). Network loading observations were based on a "before and after" observation of the cumulative amount of information sent through the router to an IP address of interest, during an event of interest. In practice, the network loading specified in Step 6.3 was derived from taking the difference between the network loading in Step 6.6 (after) and Step 5.1 (before). In view of the difference in cumulative total approach, the network loading observations specified in Step 3.1 were not applicable and not performed.

(2) CPU Loading. CPU loading was periodically observed on NRaD machines using local graphical utilities, indexed in 10 per cent partitions. Qualitative estimates of remote machine CPU loading (very heavy during the running of the remote configuration sensing script) were occasionally made. CPU loading was not routinely observed and recorded.

b. Communications Outages. By design, communications outages were scripted, imposed, and revised in a free-wheeling manner in order to pursue communications outage issues as they developed. See General Comment 5 in Appendix B. Accordingly the specific steps listed in Table 6 for the Communications Outage Module were not always followed.

c. Direct Install vs. Patch. By design, direct installs of software were scripted, imposed, and revised in a free-wheeling manner in order to pursue direct install issues as they developed. Specific steps for direct install were neither provided (in the Draft Test Description) or followed.

SECTION 5 - EVALUATION AND RECOMMENDATIONS

5.1 EVALUATION

a. Minimum Test Requirements. Minimum test sequence requirements (1RC & PSC) were satisfactorily completed for Phases 1, 2, and 3.

b. Additional Test Requirements. Additional special test sequences, with continuous communications and communications outages were satisfactorily completed for Phases 1, 2, and 3.

c. Remote Software Configuration Sensing. Product(s) under evaluation did not have a remote configuration sensing capability for software although vendor literature (e.g., Tivoli Inventory Users Guide) describing the current version of the product detail remote software configuration sensing capabilities.

d. Testing On-Line Services in a Heterogeneous Environment. Test sequences involving a UNIX server and a Windows NT client were inconclusive and are ongoing. Remote sensing of the configuration of a Windows NT machine appeared to be limited to rather high level (properties only).

e. Communications Outages. Test sequences with communications outages generally indicated a "pick up the on-line service from where we left off" response to outages that did not result in time-outs; and "start the on-line service from scratch" response to outages that resulted in time-outs. This "start from scratch" condition can be somewhat mitigated by sending several "small" size files, rather than one large file. But this process requires manual partitioning and does not appear to be supported by utilities/tools of the Product(s) under evaluation.

f. Direct Install of Software. Test sequences with direct install of software were successfully conducted based on current test description requirements. Additional test requirements to validate the effectiveness of the install are under development.

g. Test & Evaluation Oriented Metrics. Product(s) under evaluation do not appear to have easily available metrics to support on-line testing, particularly in terms of network and CPU loading.

5.2 RECOMMENDATIONS

a. Minimum Test Requirements. Conduct minimum test sequences (1RC and PSC) for Phase 4 (designated PACFLT ship) using connectivity that involves some “through the ether” component (i.e., connectivity that is not entirely terrestrial).

b. Additional Test Requirements. . Conduct additional special test sequences for Phase 4 (designated PACFLT ship) using connectivity that involves some “through the ether” component (i.e., connectivity that is not entirely terrestrial).

c. Remote Software Configuration Sensing. Verify status of remote software configuration sensing capabilities for current and planned versions of Product(s) under evaluation. Determine ability (if any) to tailor software (and hardware) configuration sensing for particular machines and/or particular applications (such as described for the “Profile Manager” in the Tivoli Inventory Users Guide).

d. Testing On-Line Services in a Heterogeneous Environment. Continue testing of UNIX and Windows NT machines in Phase 1, 2, 3 & 4 configurations.

e. Communications Outages. Continue investigating application and performance of on-line service under various communications outage conditions. Investigate features of Product(s) under evaluation to manage communications outages, particularly in terms of mitigating the apparent (as observed in testing to date) requirement to “start from scratch” after an attempted on-line service session times out as a result of a communications outage.

f. Direct Install of Software. Continue investigation of direct installs of various size software files (patches and larger) under various communications outages (with and without time outs). Investigate and develop additional test requirements to validate the effectiveness of the install.

g. Test & Evaluation Oriented Metrics. Investigate features of Product(s) under evaluation that can generate metrics to support the testing described in this document (and associated documents listed in Paragraph 2.1).

SECTION 6 - NOTES

6.1 ACRONYM LIST

ADP	Automatic Data Processing
AMS	Application Management Specification
CAU	Computer Associates UNICENTER
CINCPACFLT	Commander in Chief, U. S. Pacific Fleet
COMNAVSURFPAC	Commander Naval Surface Force, US Pacific Fleet
COMSEC	Communications Security
COTS	Commercial-off-the-Shelf
CPU	Central Processing Unit
DID	Data Item Description
DMI	Desktop Management Interface
EASTPAC	Eastern Pacific
GCCS	Global Command and Control System
IT	Information Technology
IV&V	Independent Verification & Validation
JMCIS	Joint Maritime Command Information System
JOSDEP	JMCIS On-Line Services Demonstration Plan
JOSTED	JMCIS On-Line Services Test Description
JOSTEP	JMCIS On-Line Services Test Plan
JOSTER	JMCIS On-Line Services Test Report
JWANS	JMCIS WAN Support
MLS	Multi-Level Security
NCCOSC	Naval Command, Control and Ocean Surveillance Center
NCI	NCCOSC Command Internet
NCTAMS	Navy Computer and Telecommunications Area Master Station
NES	Network Encryption System
NLMs	NetWare Loadable Modules
NRaD	NCCOSC Research, Development, Test & Evaluation Division
NT	(Windows) NT
O&R	Observe & Record
OMG	Object Management Group
OPSEC	Operational Security
OSF	Open Software Foundation
PCs	Personal Computers

PTRV	(Phase Tailored) Pre Test Readiness Validation
SIPRNET	Secret Internet Protocol Router Network
SPAWAR	Space and Naval Warfare Systems Command
STEP	Standard Tactical Entry Point
STF	Software Test Description
STP	Software Test Plan
TEP	Tivoli Evaluation Package
TIV	TEP Installation Validation
TME 10	Tivoli Management Environment 10
TMF	TME 10 Framework
TMP	Tivoli Management Platform
TMR	Tivoli Management Region
WAN	Wide Area Network

6.2 TERMINOLOGY

a. Client-Server Relationships

(1) Server. Designates the machine providing the On-Line service from NRaD.

(2) Client. Designates the machine receiving the On-Line service from the NRaD Server. In Tivoli terminology, this "client" machine may in fact serve other machines, particularly on a regional basis. Accordingly, the term "Target" or "Remote Machine" may be used to refer to a machine receiving On-Line service from the NRaD server, if there is possibility of confusion in distinguishing between server and client functions.

b. Test Structure Terminology. See Paragraph 1.4.

APPENDIX A - JMCIS ON-LINE TEST LOG

22 JANUARY 1997

Posted Install of a Small Patch on a Windows NT Machine (PWSC(1)). Completed satisfactorily.

23 JANUARY 1997

a. Remote Configuration Sensing of One Windows NT Machine (1RWC(1)).

An attempt was made to remotely sense hardware and software configuration on a Windows NT machine. Results were limited to high level properties. Detailed configuration information was not obtained. See Test Comment 1 (Item B.1 in Appendix B).

b. Remote Configuration Sensing of One (UNIX) Machine (1RC(1)). Completed satisfactorily (see Test Comment 2 for "Satisfactory Test Sequence Criteria"). Took 32 seconds to run search at the remote machine (Lanai). Took 42 seconds (10 additional seconds) to run search by way of the Tivoli Server (i.e., the 1RC(1) Test Sequence).

c. Remote Configuration Sensing of One (UNIX) Machine (1RC(3)). Completed satisfactorily. Took 12 minutes 30 seconds to run search at the remote (CINCPACFLT) machine. Took 16 minutes 27 seconds (4 additional minutes) to run search by way of the Tivoli Server (i.e., the 1RC(3) Test Sequence). CPU loading was very high because of the script. See Test Comments 3 and 4.

d. Posted Install of Small Patch (PSC(3)). Completed satisfactorily. Used 19.tar file. Took 26 seconds. Network loading (see paragraph 4.2.a.(1)): 267,757. After posting, attempted to post again. Received (anticipated) report that: "19.tar already installed. No installation necessary." This action took 10 seconds.

e. Posted Install of Variable Patch (PVC(3)). Completed satisfactorily. Used 18.tar file, a file roughly 9 times as large as the PSC(3) (19.tar) file. Took 3 minutes 24 seconds. Experienced communications problems during this test sequence. Received report that: "g355 high-level TCP Timeout. Try again."

f. Remote Configuration Sensing of One (UNIX) Machine (1RC(2)). Completed satisfactorily. Took 9 seconds to run search at the remote machine. Took 19 seconds

(10 additional seconds) to run search by way of the Tivoli Server (i.e., the 1RC(2) Test Sequence).

g. Posted Install of Small Patch (PSC(2)). Completed satisfactorily. Used 19.tar file. Took 17 seconds. Network loading: 271,038. After posting, attempted to post again. Received (anticipated) report that: "19.tar already installed. No installation necessary." This action took 7 seconds.

h. Posted Install of Variable Patch (PVC(2)). Completed satisfactorily. Used 18.tar file, a file roughly the size of the PSC(2) (19.tar) file. Took 70 seconds. Network loading: 1,732,559. After posting, attempted to post again. Received (anticipated) report that: "18.tar already installed. No installation necessary." Posted Install of Variable Patch (PVC(3)). Completed satisfactorily. Used 13.tar file, a file roughly 9 times as large as the PSC(3) (19.tar) file. Took 3 minutes 30 seconds. Network loading: 1,724,148.

k. Posted Install of Variable Patch (PVO(3)) with Imposed Communications Outage. Test Sequence Inconclusive. Communications hung up. This action took 7 seconds.

i. Posted Install of Variable Patch (PVC(3)). Completed satisfactorily. Used 13.tar file, a file roughly 9 times as large as the PSC(3) (19.tar) file. Took 3 minutes 30 seconds.

k. Posted Install of Variable Patch (PVO(3)) with Imposed Communications Outage. Test Sequence Inconclusive. Communications hung up.

27 JANUARY 1997

a. Posted Install of Small Patch (PSC(3)). Completed satisfactorily. Used 19.tar file. Took 30 seconds.

b. Posted Install of Small Patch with Imposed Communications Outage (PSO(3)). Completed satisfactory for communications outages less than time-out parameter. Results inconclusive for communications outages greater than time-out parameter. See Test Comment 5 for discussion of time-out parameter and other file transfer interruption considerations.

c. Posted Install of Variable Patch (PVC(3)). Completed satisfactorily. Used 13.tar file, a file roughly 10 times as large as the PSC(3) (19.tar) file. Took 3 minutes 30 seconds.

d. Posted Install of Variable Patch with Imposed Communications Outage (PVO(3)). Completed satisfactorily. Test sequence involved a two file (13.tar and 22.tar) "package". The 22.tar file is roughly 4 times as large as the 13.tar file. The

patch transfer was initiated. Once the 13.tar file transfer was complete and the (larger) 22.tar file transfer was in progress, a communications outage was imposed. The outage was maintained until a Tivoli imposed time-out session termination was observed (at about 3 minutes). Immediately after the time out, the remote machine indicated that both files 13.tar (the completely transferred file) and 22.tar (the partially transferred file) were "installed". A few seconds later, a Tivoli feature sensed that the 22.tar file was incomplete and deleted it. A subsequent attempt to install the 13.tar file generated a report (at the Tivoli server) that: "13.tar already installed. No installation necessary." A subsequent attempt to install the 22.tar file (with continuous communications) resulted in the installation of the 22.tar file. See Test Comment 5.

28 -30 JANUARY 1997

Continued testing with emphasis on communications issues (see Test Comment 5) and direct install (as contrasted to patch) of software (see Test Comment 6). On 30 January 1997, a successful direct install of a small (about 1.5Mb) patch between Coconut and Lanai (DFSC(1)) was conducted.

APPENDIX B - JMCIS ON-LINE TEST COMMENTS

B.1 REMOTE SENSING OF WINDOWS NT MACHINE

With Tivoli server on a UNIX machine, an attempt was made to remotely sense the configuration of a Windows NT Machine (Test Sequence 1RWC(1)). Testers were unable to sense either software or hardware. Selecting a "Properties" icon on the Tivoli graphical user interface (GUI) resulted in a report (at the Tivoli server) of high level properties of the Windows NT Machine. There may be additional features not readily apparent (in either Tivoli documentation or GUI) which support more robust remote sensing in a heterogeneous environment. Continuing to investigate.

B.2 SATISFACTORY TEST SEQUENCE CRITERIA

a. Remote Configuration Sensing. Automated file comparison of configuration file generated "locally" at the remote machine and the configuration file (for the remote machine) received at the Tivoli server. For a satisfactory test sequence, there must be no significant (i.e., configuration related) differences noted. Minor non-configuration differences associated with transmitting files (e.g., headers) are acceptable.

As discussed in the JMCIS On-Line Services Test Description (JOSTED), this comparison simply checks the accuracy of the file transfer process (i.e., the on-line service process) and not the accuracy or efficiency of the configuration sensing tool. As note in Test Observation 1, the tested version of Tivoli did not have a software configuration sensing feature (according to Tivoli engineers). To accommodate testing, an interim software configuration sensing script was developed and utilized. When Tivoli is upgraded to provide a software configuration sensing functionality, the current comparison testing criteria (compare remote machine configuration file generated at remote machine with remote machine configuration file received at Tivoli server) may be augmented to include comparison of KNOWN (by some process) remote machine configuration with remote machine configuration file received at Tivoli. This criteria will evaluate both the fidelity of the on-line file transfer process (the focus of the current criteria) and the fidelity of the configuration (hardware & software) sensing tool (not currently evaluated).

b. Posted Install of (Small or Variable) Patch. File comparison of patch file at Tivoli server with file posted at remote machine. Comparison focuses on file size. If file size indicates a possible discrepancy, the file at the remote machine is compared with the file at the Tivoli server on the component level.

Tivoli provides a feature in which, subsequent to posting ("installing" in Tivoli terminology) a file (e.g., 19.tar) on a remote machine, if a second attempt is made to post the same file, the attempt is aborted and an appropriate message (e.g.: "19.tar already exists. No installation necessary.") is passed to the Tivoli server. This process is used to check the fact that the file has been posted. But it does not guarantee that the posted file has been left uncorrupted. The file comparison procedure described above is used for this purpose.

B.3 REMOTE SOFTWARE SENSING.

The Tivoli Inventory User's Guide provides a detailed description of Tivoli Inventory's capabilities to remotely sense both hardware and software configurations. However, Tivoli engineers have stated that current Tivoli version remotely senses hardware but not software. They further stated that an upcoming upgrade would contain software sensing capabilities. For the purposes of this test, a script was written to perform basic software sensing. The objective was to demonstrate the ability to perform this type of on-line service, not to evaluate the functionality of the script (which will be discontinued when the promised software upgrade is implemented). Discussion continues regarding the actual timing and functionality of this software upgrade.

B.4 CONNECTIVITY BETWEEN NRaD & CINCPACFLT

a. Phase 2 Connectivity.

(1) NRaD to CINCPACFLT: Network Encryption System (NES) at NRaD to NCCOSC Command Internet (NCI) to NES at CINCPACFLT.

(2) CINCPACFLT to NRaD: Secret Internet Protocol Router Network (SIPRNET).

b. Phase 3 Connectivity between NRaD & CINCPACFLT. Can be either NES based NCI or SIPRNET. For January 1997 testing, connectivity was NES based NCI.

B.5 COMMUNICATIONS OUTAGES AND FILE TRANSFERS

A major focus of testing involving communication outages was the effect of these outages on file transfers.

a. Background. Before discussing this issue, the following background material is provided:

(1) For any communications session experiencing a communications outage, there is typically a "time-out" parameter that, when exceeded, will cause the session to terminate. In the context of this testing, that limiting parameter was 3 minutes, after which Tivoli terminated the session. In discussions, the termination of a session after a time-out parameter is exceeded is referred to as "timed out".

(2) A file posted on a remote machine is referred to as "installed" in Tivoli terminology.

(3) When a file is fully posted ("installed") on a remote machine, it is desirable that subsequent attempts to post the same file be interrupted. Tivoli provides such a feature. For example, if file 13.tar is posted on a remote machine, and an attempt is made to post the same file to the same machine, the attempted posting is interrupted and the Tivoli server receives the report: "13.tar already installed. No installation necessary." This feature is used as "quick check" after file posting. It checks for the presence of the file; not for the contents of the file, per se.

(4) When a file is only partially posted (as might happen in a communications outage) on a remote machine, it is generally desirable that the portion received at the remote machine be retained and the missing portion be (re)transmitted. This is similar to the concept of packet data services. Consider for example, a file transfer that, if uninterrupted, will take ten minutes. In this example, the file transfer is interrupted at the end of nine minutes. Once communications are restored, it would be desirable that the transaction could be satisfactorily completed in one minute (plus overhead) rather than ("starting from scratch") ten minutes.

In general, it appears that Tivoli cannot "save" the portion already transmitted but must start from scratch. CA UNICENTER vendors have also indicated that UNICENTER would probably have to "start from scratch" because of, among other things, data compression effects.

If the process must "start from scratch" it is imperative that effective configuration management be applied to ensure that, upon eventual successful completion of the file transfer, there be an unambiguous single file "posted" on the remote machine. Tivoli accomplishes this feature by noting the presence of incomplete files (particularly in the context of a timed out communications session) and then (within some set time period (usually about 10 seconds)) deleting the incomplete file.

b. File Transfer Dynamics. File transfer is the focus of the on-line evaluation of remote configuration sensing and posted install. During testing, the following observations were made regarding a communications outage imposed when a file transfer is in progress:

(1) If the time period of the communications outage is less than the time-out parameter, the file transfer simply picks up where it left off. There is no requirement to "start from scratch".

(2) If the time period of the communications outage is greater than the time-out parameter, the file transfer is aborted. After a set period of time, the incomplete file on the remote machine is deleted. In order to accomplish the file transfer, the process must “start from scratch”.

(3) If multiple discrete files are sent in a single posting event, and there is a communications outage that is times such that one or more files are completely posted and one file is in the process of file transfer when the outage occurs, then the following happens:

(a) Files completed transferred remain posted.

(b) The file that was incompletely posted will be deleted.

(c) To complete the transfer, the incomplete file must be sent in its entirety (“start from scratch”) along with any files that had yet to be transmitted at the time of the outage.

The above discussion suggest that some sort of packetizing schema may be useful for posting large software installations. It does not appear that any of the products under evaluation have a capability to do this in a manner that is both automated and optimized to trade-off increases in overhead with decreases in file retransmissions. Manual “packetizing” was performed to identify the results discussed above.

B.6 DIRECT SOFTWARE INSTALL VS POST

The issue of a direct software install vs a software patch is discussed in the JMCIS On-Line Test Plan (JOSTEP) and the JMCIS On-Line Test Description (JOSTED). In general, software distribution from NRaD is tested and evaluated in terms of a patch that is posted at a remote machine that may then control the actual subscribers, scheduling, and post-install testing of a software installation.

For example, NRaD may post a software patch to a workstation on a deployed LHD that is the flagship of an Amphibious Ready Group (ARG). The Commander of the Amphibious Task Force (CATF) and the Commander Landing Force (CLF) may then use ARG e-mail to control direct installs in accordance with ARG derived schedules. Another possible application of a direct install is when the operator of an activity with a single workstation uses emerging Information Technology (IT-21) capabilities to browse the JWANS Home Page (yet to be established) and determine the availability of a JMCIS/GCCS software upgrade. This operator could then use the configuration sensing feature to determine the readiness of his/her workstation to accept the upgrade and then request (at a time controlled by the workstation operator) a direct install and post-install testing.

In each of the above examples, the commander of the activity employing the GCCS/JMCIS work stations controls the parameters of the direct install process.

On 30 January 1997, a successful test sequence (DFSC(1)) involving the direct install of a small patch on a remote machine was conducted.

By allowing the JWANS On-Line Service user to tailor a post vs direct install concept to his/her unique requirements, the process of software upgrades can be simplified and coordinated with other evolutions and requirements.